



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/667,730   | 09/22/2003  | Georg Schmidt        | MUH-12777           | 9685             |
| 24131  | 7590        | 09/22/2004           | EXAMINER            |                  |
| LERNER AND GREENBERG, PA<br>P O BOX 2480<br>HOLLYWOOD, FL 33022-2480 |             |                      | HUYNH, ANDY         |                  |
|  |             |                      | ART UNIT            | PAPER NUMBER     |
|  |             |                      | 2818                |                  |

DATE MAILED: 09/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                               |                                |  |
|------------------------------|-------------------------------|--------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/667,730 | Applicant(s)<br>SCHMIDT ET AL. |  |
|                              | Examiner<br>Andy Huynh        | Art Unit<br>2818               |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 30 August 2004.  
 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.  
 4a) Of the above claim(s) 18-20 is/are withdrawn from consideration.  
 5) ☒ Claim(s) 14 and 15 is/are allowed.  
 6) ☒ Claim(s) 1-11, 16 and 17 is/are rejected.  
 7) ☒ Claim(s) 12 and 13 is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☒ All b) ☐ Some \* c) ☐ None of:  
 1. ☒ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>09/22/03</u> . | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION*****Election/Restrictions***

In the Response to Election/Restriction Requirement dated August 30, 2004, Applicant has elected Group I, claims **1-17**, drawn to a device for prosecution is acknowledged. Because Applicant did not distinctly and specifically point out the supposed error in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Accordingly, claims **18-20** are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 35 § 1.142(b) and MPEP § 821.03. Applicant has the right to file a divisional application covering the subject matter of the non-elected claims **18-20**, drawn to a method.

***Priority***

Acknowledgment is made of applicant's claim for International Application No. PCT/DE02/00989 filed 03/19/2002 and foreign priority under 35 U.S.C. 119(a)-(d) based on an application filed in GERMANY, 101 13 495.9 on 03/20/2001 and 101 14 963.8 on 03/27/2001.

***Information Disclosure Statement***

This office acknowledges receipt of the following items from the applicant:  
Information Disclosure Statement (IDS) filed on 09/22/2003. The references cited on the PTOL 1449 form have been considered.

***Claim Rejections - 35 U.S.C. § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-7 are rejected under 35 U.S.C. 102(a) as being anticipated by Hehn et al. (WO 00/59051, dated 10/05/2000 hereinafter referred to as Hehn).

Regarding claims 1-7, Hehn discloses in Fig. 1 a magnetoresistive semiconductor element/a microelectronic device with tunnel junctions, comprises:

a first contact (1; 3) made of a semi-magnetic material;

a second contact (3; 5) made from magnetic or semi-magnetic material;

a layer of a nonmagnetic semiconductor/a layer of insulating material (2; 4)

configured between said first contact and said second contact; and

a tunnel barrier (2; 4) configured between said first contact and said layer of said nonmagnetic semiconductor (English Abstract).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2818

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hehn et al. (WO 00/59051, dated 10/05/2000 hereinafter referred to as Hehn) in view of Fiederling, R. et al.: "Injection and Detection of a Spin-Polarized Current in a Light-Emitting Diode", Nature, [www.nature.com](http://www.nature.com), Vol. 402, December 16, 1999, pp. 787-790 hereinafter referred to as "Fiederling", Applicant submitted prior art (ASPA).

Hehn discloses the all claimed limitations except for the magnetoresistive semiconductor element/the microelectronic device with tunnel junctions wherein said semi-magnetic material is a II-IV semiconductor; and wherein said II-VI semiconductor is  $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$  with  $0 < x < 1$ ,  $0 < y < 1$  and  $0.0001 < y < 0.2$ . Fiederling teaches that the semi-magnetic material is a II-IV semiconductor, and the II-VI semiconductor is  $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$  with  $0 < x < 1$ ,  $0 < y < 1$  and  $0.0001 < y < 0.2$  (p. 789). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to utilize the semi-magnetic material is a II-IV semiconductor, and the II-VI semiconductor is  $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$  with  $0 < x < 1$ ,  $0 < y < 1$  and  $0.0001 < y < 0.2$ , as taught by Fiederling, to incorporate into Hehn' structure to arrive the claimed limitation because the II-VI semiconductor  $\text{Be}_x\text{Mn}_y\text{Zn}_{1-x-y}\text{Se}$  has particular properties that make it ideally suitable as a spin-aligner for injecting electrons (p. 787).

Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hehn et al. (WO 00/59051, dated 10/05/2000 hereinafter referred to as Hehn) in view of Gallagher et al. (USP: 5,640,343 hereinafter referred to as "Gallagher").

Hehn discloses the all claimed limitations except for the magnetoresistive semiconductor element further comprises a Schottky diode/a pn diode for providing a

Art Unit: 2818

current path for decoupling; and for providing a current path for decoupling. Gallagher teaches the diode in the memory cell functions as unidirectional current valve. Thus any such diode-like device, as Schottky barrier diodes, can be used in place of the preferred silicon junction diode. The voltage swing for the word lines and bits lines are reduced for Schottky diodes with a lower diode voltage than silicon junction diodes. Also, the charge storage effects are smaller for Schottky diodes, which decrease the time to complete a read operation (col. 10, line 58-col. 11, line 36). Gallagher also teaches in Figs. 10A-10C that a memory cell uses a diode (37) formed on a semiconductor substrate (100). For efficiency, a diode (37) compatible with silicon VLSI processing is used as the memory cell diode. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate a Schottky diode/a pn diode used in the memory cell, as taught by Gallagher into Hehn's structure to form the claimed limitations for efficiency and reducing the voltage swing for the word lines and bits lines.

Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hehn et al. (WO 00/59051, dated 10/05/2000 hereinafter referred to as Hehn).

Hehn discloses the all claimed limitations as disclosed in claim 1 except for a magnetic sensor/a read head for reading information stored in magnetic storage media comprises a plurality of electric feed and discharge lines, each one said plurality of electric feed and discharge lines connected to a respective one of said first contact and said second contact; and a measuring device connected to said plurality of electric feed and discharge lines for measuring a change in electrical resistance. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to

Art Unit: 2818

connect each of a plurality of electric feed and discharge lines to a respective one of the first contact and the second contact; and a measuring device connected to the plurality of electric feed and discharge lines for measuring a change in electrical resistance since it has been held that the such set up of a plurality of electric feed and discharge lines and a measuring device, where needed, involves only routine skill in the art.

***Allowable Subject Matter***

Claims **12-13** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, since the prior art made of record and considered pertinent to the applicant's disclosure does not teach or suggest the claimed limitations. Hehn, Fiederling and Gallagher, whether taken alone or in combination, fail to teach the claimed invention a storage element comprises the magnetoresistive semiconductor element and a ferromagnetic element configured adjacent said first contact as recited in claim **12**.

Claims **14 and 15** are allowed. The following is a statement of reason for the indication of allowable subject matter:

Claims **14 and 15** are considered allowable since the prior art made of record and considered pertinent to the application's disclosure do not teach or suggest the claimed limitations. Hehn, Fiederling and Gallagher, whether taken alone or in combination, fail to teach the claimed invention a field effect transistor comprises at least one first contact of a semi-magnetic material for injecting spin-polarized charge carriers into said source electrode and/or for extracting spin-polarized charge carriers from said drain electrode; a

Art Unit: 2818

tunnel barrier configured between said first contact and said source electrode; and a tunnel barrier configured between said first contact and said drain electrode as recited in claim 14; and a bipolar transistor, comprises at least one first contact for injecting spin-polarized charge carriers into said emitter and/or for extracting spin-polarized charge carriers from said collector; a tunnel barrier configured between said first contact and said emitter; and a tunnel barrier configured between said first contact and said collector as recited in claim 15.

### *Conclusion*

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy Huynh, (571) 272-1781. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The Fax number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the -status of this application or proceeding should be directed to the receptionist whose phone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status



Art Unit: 2818

information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ah

09/18/04

A handwritten signature in black ink, appearing to read "Andy Huynh", with a stylized flourish at the end.

Andy Huynh

Patent Examiner